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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/820,294

04/08/2004

Sin-Doo Lee

7463

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7590

11/02/2005

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EXAMINER

SCHECHTER, ANDREW M

ART UNIT

PAPER NUMBER

2871

DATE MAILED: 11/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/820,294

Applicant(s)

LEE ET AL.

Examiner

Andrew Schechter

Art Unit

2871

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,6-9,13-19 and 23-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 24-30 is/are allowed.
- 6) ☒ Claim(s) 1,2,4,6-9,13-15,17-19 and 23 is/are rejected.
- 7) ☒ Claim(s) 16 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 11 August 2005 have been fully considered but they are not persuasive.

The applicant argues [p. 9] that *Kataoka* does not mention that the various layers of the LCD are laminated. This is not persuasive. "Laminated" means to be composed of layers of firmly united material, which the layers in *Kataoka* clearly are; it is irrelevant whether *Kataoka* uses the word "laminated".

Claim Objections

2. Claim 14 is objected to because of the following informalities: claim 14 should depend on claim 13 rather than on claim 14. Appropriate correction is required.
3. Claim 16 is objected to because of the following informalities: "surface undulation" should be "surface undulations". Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 2, 4, 6, 8, 9, 13, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Kataoka et al.*, U.S. Patent No. 6,362,863.

Kataoka discloses [see Figs. 12, 19, and 20, for instance] a liquid crystal display comprising an upper substrate [40] having the inner surface on which an upper electrode [44] and an upper grating film [48 and/or 52] having surface undulation are laminated; a lower substrate [42] having the inner surface on which a lower electrode [46] and a lower grating film [50 and/or 54] having surface undulation are laminated, the said inner surface of the lower substrate being located facing the inner surface of the upper substrate; and the liquid crystal [58] having dielectric anisotropy [col. 6, lines 11-13] is in the space between the upper and lower substrates.

Kataoka does not necessarily disclose that the liquid crystal is “sealed” in the space. The examiner takes official notice that it is well-known to seal liquid crystal between substrates [see class 349, subclass 153 “liquid crystal seal”]; it would have been obvious to one of ordinary skill in the art at the time of the invention to seal the liquid crystal, motivated by the desire to avoid having the liquid crystal leak out of the device.

Kataoka does not disclose in Fig. 12 how many of the undulations are in one period of a pixel (that is, Fig. 12 does not have the size of a pixel marked on it). Figs. 19 and 20 show a modification of *Kataoka*’s invention in which each pixel has a predetermined period including a plurality of sub pixels having different alignment structures in one period. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the modification shown in Fig. 19 and 20 (identifying the

size of a single pixel) with the basic structure (substrates, electrodes, liquid crystal, etc.) shown in Fig. 12, motivated by the desire to produce a fully functioning LCD using the embodiment shown in Figs. 19 and 20.

Claim 1 is therefore unpatentable.

Kataoka discloses that the upper grating film is laminated upon the upper electrode, so claim 2 is also unpatentable. The lower grating film is laminated upon the lower electrode, so claim 4 is also unpatentable. The upper and lower undulations are parallel to each other, so the angle between them is either 0° or 180° , so claim 6 is also unpatentable ["between 0° and 180° is assumed by the examiner to be inclusive of 0° and 180° "]. At least one of the upper and lower grating films is a vertical alignment film [col. 6, line 9], so claim 8 is also unpatentable. The pretilt angle of the liquid crystal from the direction normal to the upper substrate or the lower substrate having a vertical alignment film is between 0° and 9° [it is 2° , col. 6, lines 35-37], so claim 9 is also unpatentable. *Kataoka* discloses that the surface undulation can be formed using a photo-reactive resin [see Fig. 6], so claim 13 is also unpatentable. *Kataoka* discloses using this structure with an MVA (multidomain vertical alignment) liquid crystal [see Fig. 13 and discussion thereof, for instance]; it would therefore have been obvious to one of ordinary skill in the art at the time of the invention to use an arrangement where the liquid crystal is rearranged in a multi-domain structure when an electric field is applied, motivated by the desire to obtain wide viewing angle display, so claim 23 is also unpatentable.

Art Unit: 2871

6. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Kataoka et al.*, U.S. Patent No. 6,362,863 as applied above, in view of *Ferguson*, U.S. Patent No. 4,693,557 and *Miller*, U.S. Patent No. 6,535,257.

Kataoka discloses that the photo-reactive resin is UV-reactive, but not that the difference between the ordinary refractive index of the liquid crystal and the refractive index of the resin is 2% or less. *Ferguson* teaches that optical transmission without scattering is maximized when the ordinary refractive index of the liquid crystal and the refractive index of a containment medium are matched as closely as possible, most preferably equal [col. 21, lines 20-25], for a resin next to the liquid crystal. *Miller* gives the same teaching for spacer material and epoxy in a liquid crystal cell [col. 5, lines 1-17]. It would have been obvious to one of ordinary skill in the art at the time of the invention to index-match the liquid crystal and the grating film in *Kataoka*, motivated by these teachings that doing so reduces undesired scattering from the interface between them. Claim 14 is therefore unpatentable.

The height of the surface undulation is determined according to the amount of the irradiated UV light, so claim 15 is also unpatentable. [This is disclosed by *Kataoka*, see Fig. 6, for instance, but it is also a product-by-process limitation which does not affect the structure claimed, so even were it not met by *Kataoka* the claim would still be unpatentable; see MPEP 2113.]

7. Claims 1, 2, 4, 6, 7, 13, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ishitaka et al.*, U.S. Patent No. 5,725,915.

Ishitaka discloses [see Figs. 1 and 11, for instance] a liquid crystal display comprising upper and lower substrates with electrodes and grating films with surface undulations on each [col. 8, lines 9-57, for instance], and liquid crystal is sealed in the space between the substrates.

Ishitaka does not necessarily disclose that the liquid crystal has dielectric anisotropy; the examiner takes official notice that it is well known for the liquid crystal for such a device to have dielectric anisotropy; it would have been obvious to one of ordinary skill in the art at the time of the invention to have it so, motivated by the desire to produce a functioning LCD.

Ishitaka discloses that the periods of the undulations in the two directions in Fig. 1 is preferably 20 μm or shorter and 1.2 μm or shorter, respectively; *Ishitaka* does not explicitly disclose what the period (size) of its pixel electrode is; the examiner takes official notice that pixel sizes greater than 20 μm and certainly greater than 1.2 μm are well known in the art, and it would have been obvious to one of ordinary skill in the art at the time of the invention to use pixel sizes larger than this, motivated by the desire to avoid unnecessary difficulty in producing such small pixels and the ability of larger pixel sizes to produce a detailed image as perceived by the human eye. Then, each of the pixels would have a predetermined period (size) which includes a plurality of sub pixels having different alignment structures in one period [as shown in Fig. 1].

Claim 1 is therefore unpatentable.

The grating film is on the electrode on top and bottom, so claims 2 and 4 are also unpatentable. The undulations are at 90° to each other [col. 28, lines 54-57], so claims

6 and 7 are also unpatentable. The surface undulation is formed using a photo-reactive resin [col. 28, lines 40ff.], so claim 13 is also unpatentable. There are polarizers with perpendicular axes and a backlight [see Fig. 11], so claim 17 is also unpatentable.

8. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Ishitaka et al.*, U.S. Patent No. 5,725,915 as applied above, in view of *Hirai et al.*, Japanese Patent Document No. 01-270024.

Ishitaka does not necessarily disclose compensation films. *Hirai* discloses [see Fig. 1], for an analogous LCD, compensation films [2 and 5] between the outer surfaces of the upper substrate and the lower substrate and the respective polarizers, wherein the optic axes of the compensation films are configured to form approximately 45° to the optic axes of the relevant polarizers [see abstract, Fig. 1]. It would have been obvious to one of ordinary skill in the art at the time of the invention to use such compensation films in the device of *Ishitaka*, motivated by the teaching of *Hirai* that this enables a high contrast ratio even at wide viewing angles [see abstract], thereby producing an improved display. Claims 18 and 19 are therefore unpatentable.

[Note: a translation of this reference can be provided in the following office action if requested by the applicant.]

Allowable Subject Matter

9. Claim 16 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. Claims 24-30 are allowed.

11. The following is a statement of reasons for the indication of allowable subject matter:

The prior art does not disclose the device of claim 16, in particular the limitations that the upper substrate has a first undulation, the lower substrate has a second undulation, and the surface undulations are one-dimensional and have a period between $\frac{1}{4}$ and 2 times the period of the pixels. Claim 16 would therefore be allowable if rewritten appropriately.

The prior art does not disclose the device of claim 24, in particular the limitations that the upper substrate has a first undulation, the lower substrate has a second undulation in a direction different from the that of the first undulation, and the liquid crystal is periodically arranged and has at least two pretilt angles in one period. Claim 24 is therefore allowed, as are its dependent claims 25-29.

The prior art does not disclose the device of claim 30, in particular the limitations that the upper substrate has a first undulation, the lower substrate has a second undulation in a direction different from the that of the first undulation, wherein the first and second undulations form at least four multi-domains in one period of the unit pixel. Claim 30 is therefore allowed.

Conclusion

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

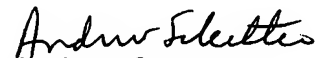
§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Schechter whose telephone number is (571) 272-2302. The examiner can normally be reached on Monday - Friday, 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert H. Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Andrew Schechter
Primary Examiner
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25 October 2005